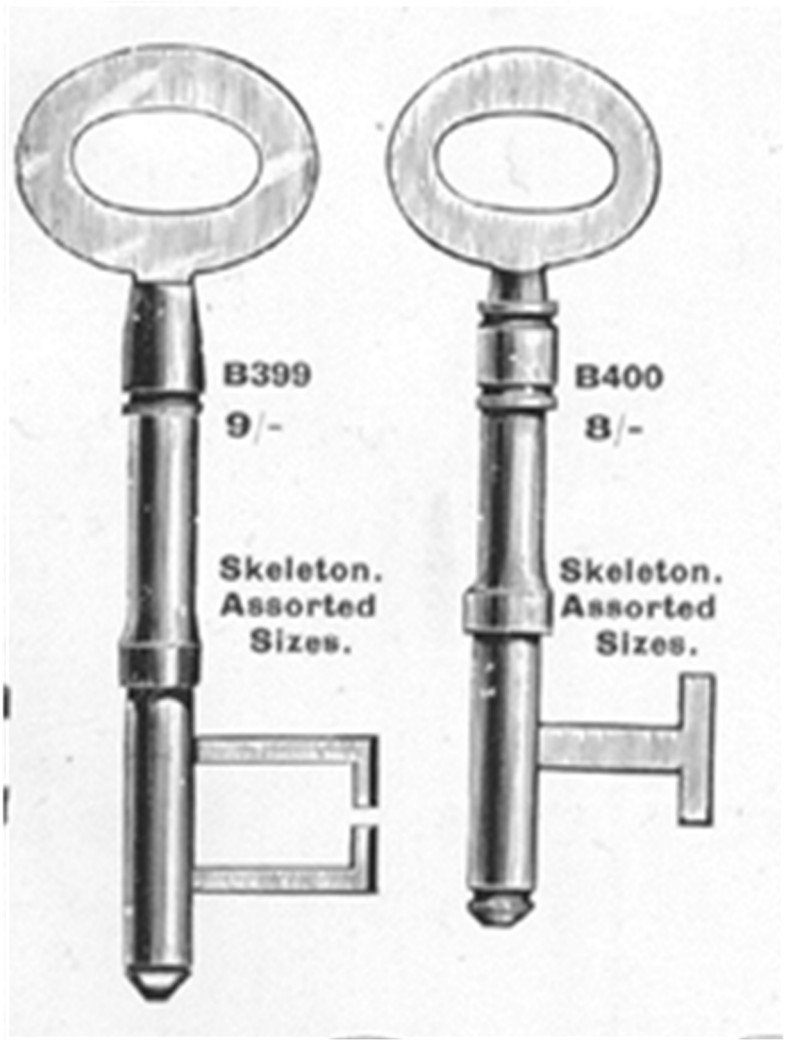


SKELETON KEYS EXPLAINED CORRECTLY

ABSTRACT

The term ‘skeleton key’ is well-known, most people think they know what it is — but the term is so often used incorrectly. All bit keys are not skeleton keys; not all skeleton keys are bit keys. A skeleton key has ward cuts at every position a ward can be placed, in a series of warded locks of a certain size and type. This paper describes various types of skeleton key.

Richard Phillips 2021

Skeleton keys explained correctly

by Richard Phillips 2021

‘5 Skeleton Keys That Open ALL Warded Locks!’

The term ‘skeleton key’ is well-known, most people think they know what it is — but the term is so often used incorrectly, more so in some parts of the world.

They are not, mostly, ‘master keys’, though in the past some have been used as such. All master keys are not skeleton keys.

Figure 1 assorted lever bit keys

Figure 2 doublebit lever safe key

Figure 3 lever cabinet pipe key

Figure 4 cabinet lever pipe key

All bit keys are not skeleton keys; not all skeleton keys are bit keys.

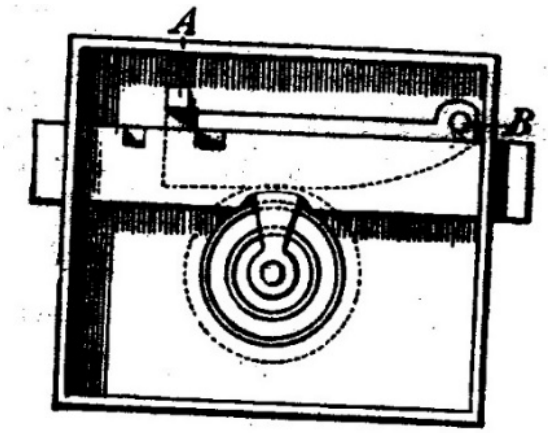


Figure 5 warded tumbler lock, with locking stump marked A

Most locks which rely solely on wards for their security have a bolt, deadlocked by one single-acting tumbler (lever) fig 5. Bolt and locking-lever are both moved by the bottom edge of the key, which must somewhere be connected to the stem of the key.

This applies to cabinet and many padlocks, and door locks. Modern warded padlocks are not all of this form.

American warded door locks

In America, door locks were made in great numbers with cast-iron cases. This is a relatively low-technology method of production. Iron castings are not as dimensionally precise as pressed steel ones, nor does cast-iron hold such fine detail,

as, e.g., cast brass or zinc. The lockcase usually has a cast pip to act as a sash ward, and there might also be a bullet ward at the keyhole. Because of the imprecision of these iron castings, the sash ward pip is of variable size and position. Sometimes, so reduced as to be practically non-existent, as in fig.6. In some US cast locks, there really were NO wards at all — such as figs.7-8. In the absence of precise machining of the lockcase, the ward cuts on the keys were necessarily somewhat wide, to ensure that all keys would pass the locks in a production run. This applies to both sash ward and bullet ward cuts, figs.9-10. However, it was still possible to achieve some ward differs with correctly cut keys, as shown figs. 11-12.

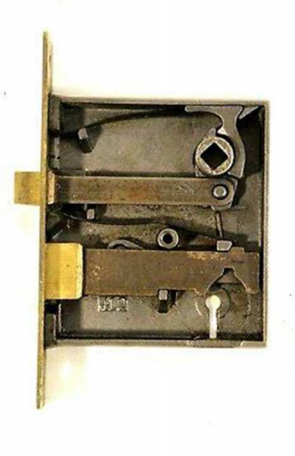


Figure 6 US mortice lock with vestigial collar ward

Figure 7 US mortice lock with no wards

Figure 8 US rim lock with no wards

Figure 9 US mortice lock with sash ward pips

Figure 10 sash ward pips marked in red

Figure 11 correctly cut warded key with sash and bullet ward cuts – this is NOT a skeleton key

Figure 12 real differs on wards were possible on US warded locks

Figure 13 pair of US rim/mortice skeleton door keys

A sash ward (a small cast pip) is present in the lock shown at figs. 9-10. But in the case of many American castiron locks, there is actually NO ward present, e.g. figs. 7-8. A notch in the bottom edge of a key blank would suffice to move the single tumbler and the bolt — no need to actually cut more of the key. Locks in some other countries were not all made like this!

Early 20C locks began to have levers also, but mostly, only 2 or 3. The number of lever differs was very few, and the patterns of lever steps used were predictable.

From the 1920s, two skeleton keys fig. 13 (they are sold as a pair) have been sold to any ordinary customer in hardware shops in America. These will indeed pass a very large proportion of the warded rim and mortice door locks made in America. The ready sale of these skeleton keys to the public practically destroys almost all of what little security these locks originally had.

Unsurprisingly, Americans generally call these locks of their experience ‘skeleton key locks’. Indeed, when a correctly fitting key is missing for these old locks, Americans often simply resort to using a skeleton key. Having almost no experience of more secure warded or lever locks, Americans generally call all locks using bit keys ‘skeleton key locks’, and all bit keys ‘skeleton keys’. By extension therefore, Americans generally now call all locks using bit keys ‘old-fashioned’, and ‘insecure’.

Warded cabinet locks

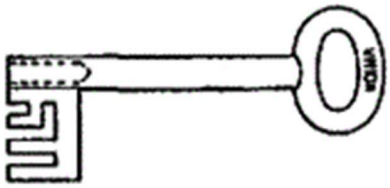


Figure 14 pipe key with wards on backplate

Tens of thousands, probably millions, of basic warded cabinet and padlocks have been made from 17-early20C.

Wheel wards are thin, blade-like obstacles, staked – concentric to the drill pin – to the backplates of basic back spring locks, fig.15. Early iron wards were susceptible to rusting and many subsequently disintegrated. Prior to the widespread use of steel, brass or copper were sometimes used for making the wards. Tinplate was also sometimes used. Brass/copper were mainly used for damp environments, and for gunpowder magazine locks.

Many have wheel wards, but other shapes were also possible, such as step wards, **Y**-wards, **L**-wards (or hook wards). Wards could be fixed to the backplate, or the cap, or both. Wards could also be arranged to intercept the bottom edge of the key bit.

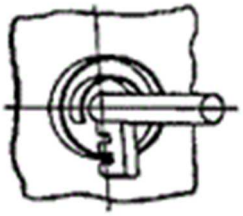


Figure 15 diagram showing wheel wards

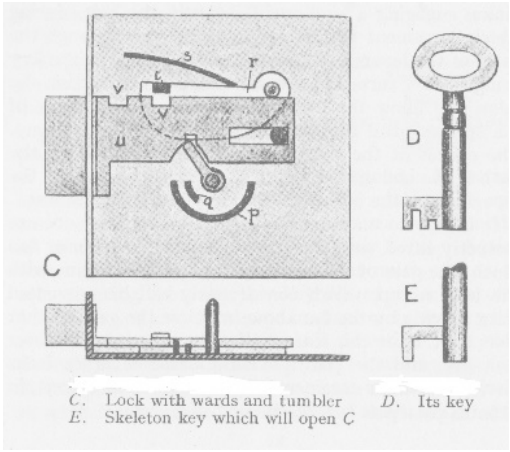


Figure 16 tumbler [cabinet] lock with wheel wards on backplate

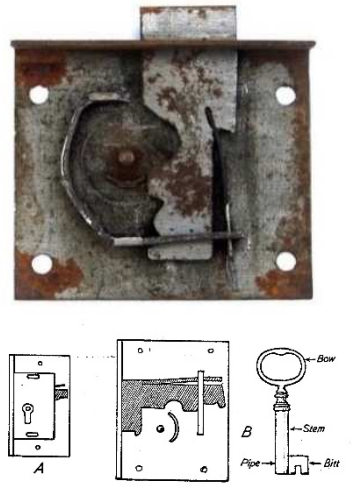


Figure 17 backspring cabinet lock

Consider a basic cabinet lock, with wheel ward fixed to the backplate. The simplest is the backspring lock, in cabinet form at fig. 17, having no locking tumbler, and relying on spring pressure and friction to keep the bolt in place. A cabinet lock with a locking tumbler and wheel wards is shown as a diagram fig. 16, which also shows its true key, and a suitable skeleton key. The drillpin on which a pipe key turns is also a ward, as several different sizes were used, but let that be ignored for the present. Fine (thin sheet iron) wards could be fixed at different distances from the drill pin, each position requiring a ward-cut in the front edge of the key. Let it be allowed that there are 4 positions for fixing a ward in a series of cabinet locks. There will be 4 different locks and 4 different keys to the series, which do not pass any other lock in the series. As production continues, the fifth lock made will be the same as the first, and so on.

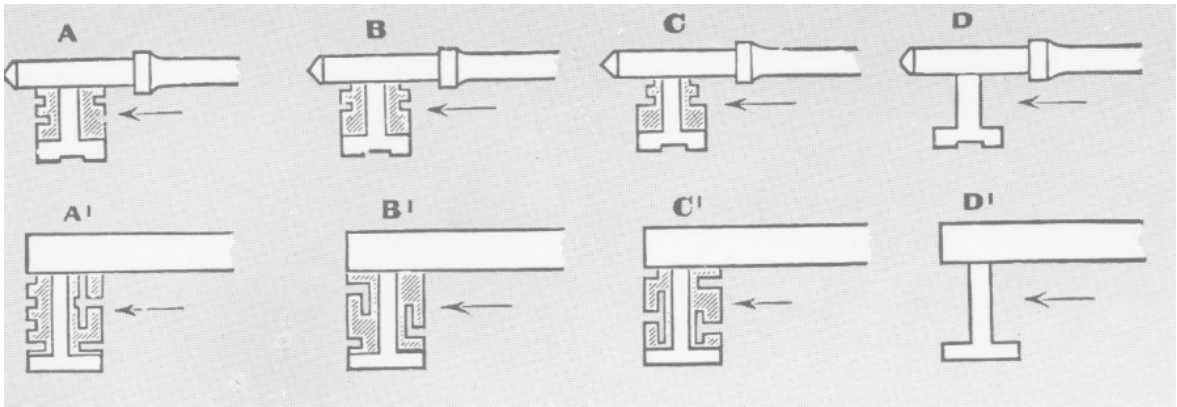


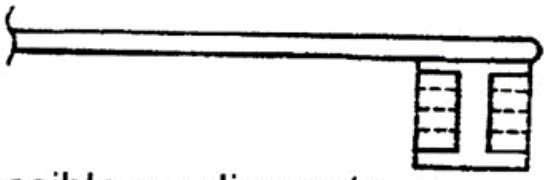
Figure 18 pin and [bottom row] pipe keys for sash ward locks, with suitable skeletons at right

The picture below shows keys for wards fitted to both backplate and cap. The principle is the same for wards on backplate only, or cap only, or both backplate and cap.

Various sizes and shapes of wards can be used, as shown, giving more key differs.

Each of the 4 keys will have one ward-cut in the front edge of the key, each in a different place. If, in a larger lock, there are more than 4 ward positions, another series of locks could be created, having two wards which are not right next to each other.

Operation of these locks requires the bottom edge of the key to be connected to the stem so as to move both the locking tumbler and the bolt, but most of the bit between is not needed. It stops a key operating other locks besides its own. If a ward-cut is made at every possible position on a single blank, all the front edge of the key will be cut away, leaving an **L**-hook shaped skeleton key. This really is a skeleton key, as shown at #4 below, fig. 19. It will pass all such locks as made for, e.g., #1-3 below.

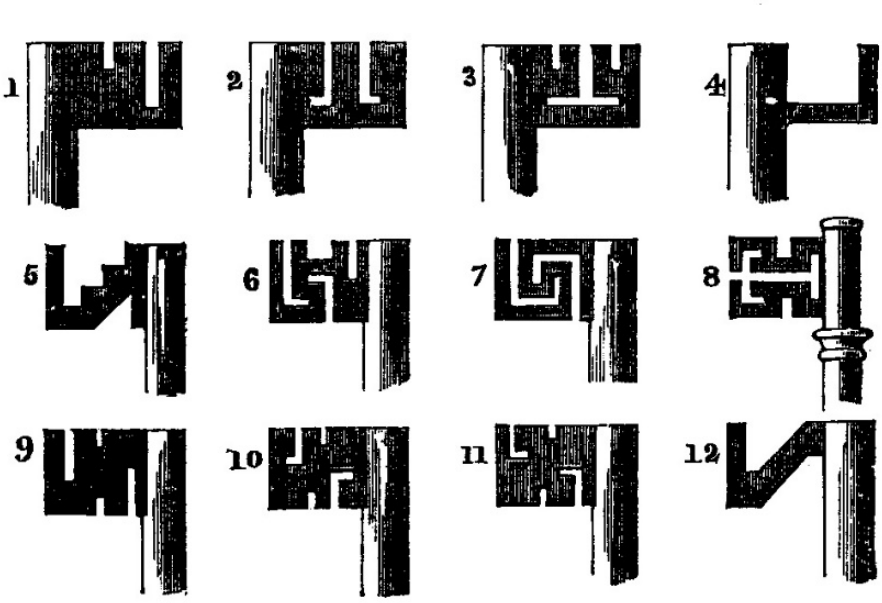


Possible warding cuts

The locksmith can defeat this skeleton by fixing wards much as before, but on the cap instead of the backplate. This creates another series of locks, whose keys will not fit the previous series. Cutting the ward cuts in every position for this series on one key will produce another skeleton key, a reverse **L**-hook.

The locksmith can defeat this skeleton by making another different series of locks, fixing the wards on both the backplate and the cap. Now the wards must not quite meet in the centre-line of the bit, or the bottom edge would become detached. Again, cutting all the ward-cuts on one key will produce a skeleton: this is the **T**-shaped skeleton, see above, fig. 18 D, D1.

Making one ward cross the centre-line of the bit from either the backplate or cap, with another, short, ward on the other side of the lock, will defeat all these skeletons. Two skeleton shapes are needed to pass such locks: the **Z**-shape or the reverse **Z**-shape, see #12 below.



Examples to shew the action of "master," or "skeleton keys."

Figure 19 various ward patterns, and skeletons keys to pass them.

Clearly, there can be no one universal skeleton for all these cabinet locks. Also, a range of sizes is needed to pass the different sizes of locks. The locksmith can add small additional wards, to intercept an **L**-hook for example, at the back edge of the key (on the cap), or the reverse-**L**, with a small ward on the backplate. Or most basic skeletons can be intercepted by a small ward which requires a small ward-cut on the bottom edge of the key, fig. 21. These extra wards add to the cost, however, so are less common, as these locks were sold cheaply in great quantity.

Figure 20 wards on backplate, and intercepting bottom edge of key

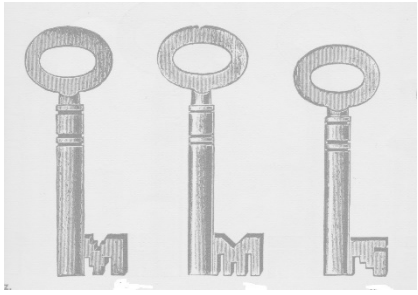


Figure 21 wards on backplate, cap, and intercepting bottom edge of key

Figure 22 wards on backplate and cap

There is one form of warding which is practically difficult to skeleton. Interlinked hook wards on backplate and cap need to be followed fairly accurately, see #6-7 above, fig. 19.

If an attempt were made to make a skeleton key for such a lock, a part of the bottom edge of the key would become detached. However, the ward-cuts weaken the key, as well as being slow to cut. They are generally only found in small cabinet keys which are too light to be damaged by being dropped on a hard floor, or large ones, such as single-sided door keys, which have a thick bit and are strong enough not to be easily damaged, figs. 23-24.

Figure 23 interlocking hook wards on a large rimlock key

Figure 24 interlocking hook wards on a strongbox key

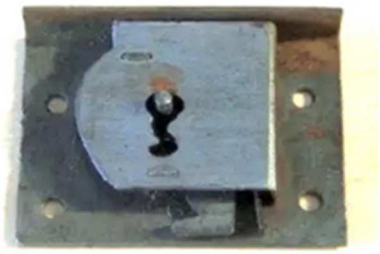


Figure 25 18C English drawer lock with bulleted keyhole, popular with Chippendale

Figure 26 18C French double-throw bridge ward rimlock with bulleted keyhole

Figure 27 19C French double-throw bridge ward rimlock with bulleted keyhole

Another form of warding, more common in European locks, but also found in some British locks, is bullet warding of the keyhole, figs. 25-27

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Two-sided door keys Britain and Europe

Door locks are mostly mounted either as rimlocks or mortice locks.

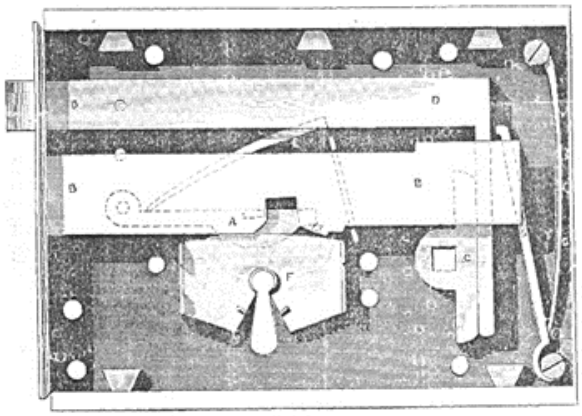


Figure 28 bridge ward tumbler rim lock uncovered

Figure 29 actual bridge ward rim lock

Rimlocks have no particular size constraint, so the lockcase can be quite thick. Such warded locks typically have a bridge ward in the middle of the lock's thickness.

Until c1818 these wards were fine wards, fig. 30, all made of thin sheet iron fixed to the bridge. Then the solid ward figs. 31-35 was invented: a brass casting finished with a lathe- or drill-press tool. Such wards require more of the key to be cut away, but the wards are resistant to corrosion and damage by wrong keys.

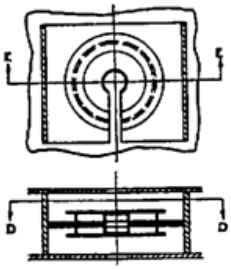


Figure 30 fine bridge ward diagrams

Figure 31 solid bridge ward

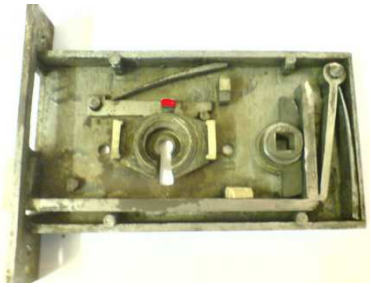


Figure 32 bridge ward tumbler lock with locking tumbler marked in red

As in other warded locks, there is a bolt and a tumbler with a stump (shown red above, fig.32), to be moved by the bottom edge of the key bit, which must remain attached to the stem. A bit key correctly cut to fit a warded lock, as fig. 34, is a warded key, not a skeleton key.

Figure 33 solid bridge ward

Figure 34 solid bridge ward with key

Figure 35 mortice lock with bridge ward, uncovered

Bridge ward locks were made in great variety of ward patterns, and sizes, reducing the success of casual trial of keys. The basic bridge ward skeleton key (such as this handmade US example, fig. 39 below) will open most such locks, if of suitable size, figs. 36-37. Adjustable versions have been made, fig 40.

Although from early in the 19C more secure locks were available, warded locks continued in use, especially in domestic use, largely because they were cheaper.

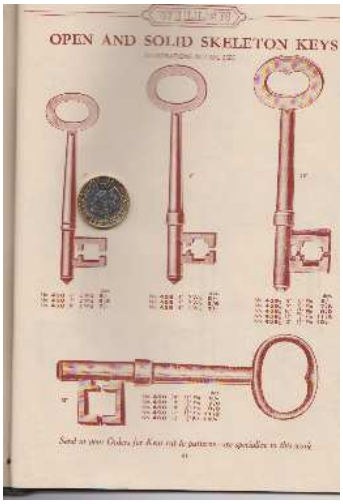


Figure 36 catalogue page showing commercial bridge ward skeleton keys in a range of sizes

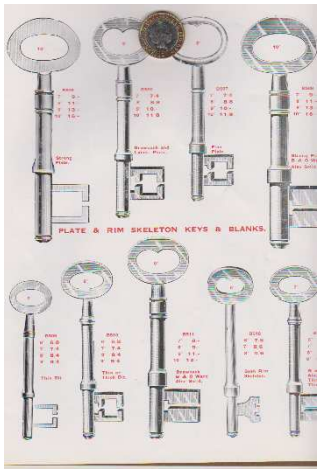


Figure 37 another catalogue page of commercial bridge ward skeleton keys and blanks, in a range of sizes

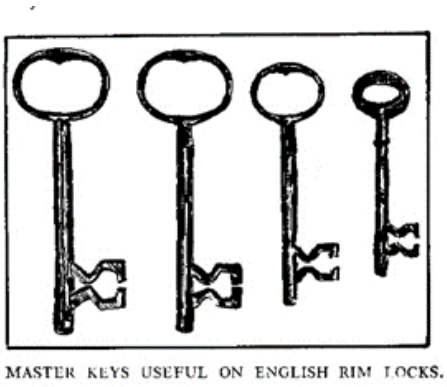


Figure 38 bridge ward skeleton keys for rim locks with a common sash ward

Figure 39 handmade US skeleton key for bridge ward locks

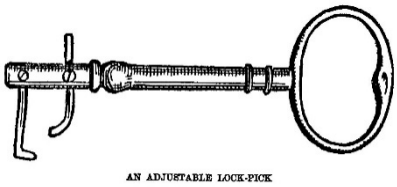


Figure 40 adjustable bridge ward pick belonging to Houdini, and right, a modern version

It is possible to add sash wards, requiring ward-cuts on the front and back edges of the key. Such wards would intercept the basic skeleton key pattern, but were not so common. Fitting sash wards would defeat the basic bridge ward skeleton key (see handmade example above, and also commercial versions), so requiring a variety of other patterns of skeleton key, such as above, fig. 38. If needed, such skeletons would generally be made by hand, by impressioning.

For supplying a key to a bridge ward lock, for example, a locksmith would allow (and the customer be charged for) 1 hour of labour, plus the cost of the key. However, most requests for keys could be supplied from stock. The locksmith bought various types and sizes of keys by the dozen, 'wards well assorted' (see below, example of part of a catalogue page for sash ward mortice keys fig. 48). But if necessary, he also had blanks in many sizes, for making a key to fit, or to pattern. Commercially-made skeleton keys were available to the locksmith, and could sometimes be useful.

Mortice locks in Britain

Mortice locks became increasingly popular from the middle of the 19C onwards, especially for more important doors. Mortice locks need a case thin enough to be fitted in the thickness of a door. They usually have sash wards rather than bridge wards. In Britain, they are also more likely than rimlocks to have bullet wards. However, in Europe, bullet wards are somewhat more common.

In Britain, and much of Europe, mortice locks were made mostly of sheet iron, until mild steel superseded iron.

Mild steel lockcases were made by stamping (commonly called pressing in the metal-working industries) from sheet steel. This technology requires a considerable capital investment in plant, for presses, powering, and dies.

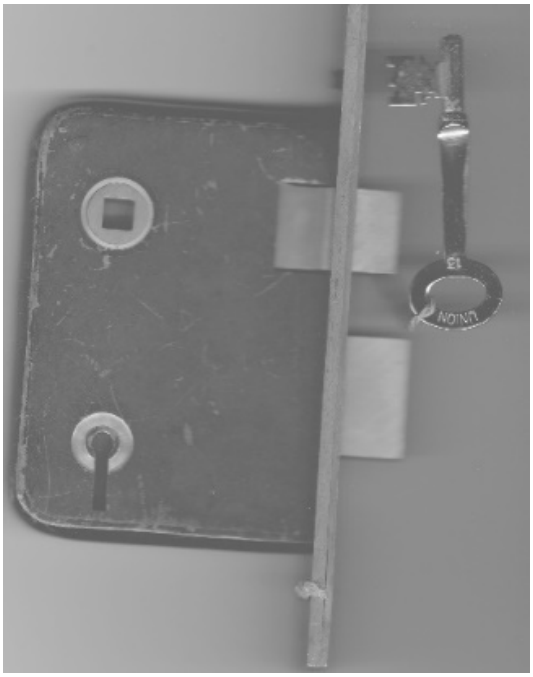


Figure 41 British 4lever mortice sash lock with sash wards. This lock was also made in 2lever

The case was blanked, punched, and formed, usually in one action. Bullet warded keyholes could be made easily by this method. Sash wards were, and still are in Britain, made by pressing into the lockcase a brass bush, which is then cut by a rotary cutter, figs. 43-45. A considerable variety of different patterns is possible, with keys accurately cut to match, and not interchangeable, fig. 43.

This means trial of keys by a casual user is not too likely to succeed. If keys are copied carelessly, (see fig. 47) with ward cuts made too wide, true differs can be lost, and prospects for success of trial of keys improve.

These warded locks (if without levers, unlike fig.42) can, however, be passed by a **T**-shaped skeleton key, as shown by D1 in fig. 18 above, and the key at right in cover illustration. As with other locks, there are various sizes, so several skeleton keys are needed. In 19-early20C Britain, many warded mortice locks were made for interior doors with sash wards and one locking tumbler.

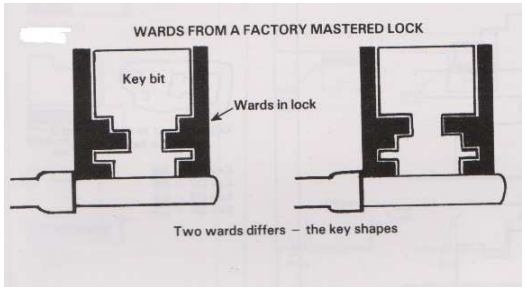


Figure 42 different sash wards

Figure 43 a sash ward cutter

Figure 44 selection of sash ward cutters (courtesy of Guardian Locks)

Figure 45 lock case with sash ward cut, ward cutter tool; and lock cover plate with keyhole bush awaiting cutting (courtesy of Guardian Locks)

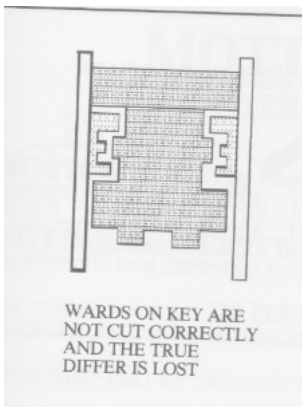


Figure 46 result of inaccurate key-cutting

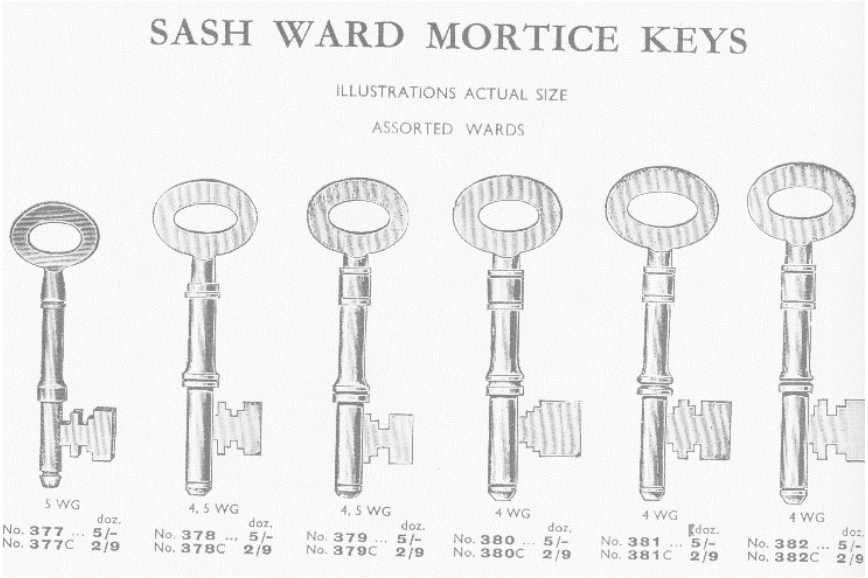


Figure 47 sash ward mortice keys, from pre-war catalogue

The variety of warded and other latches has not even been mentioned. These were single-sided, so yet other forms of skeleton keys are needed to pass these, in several sizes.

Britain continues to have some warded rimlocks intended only for privacy, usually with one or two simple wards. Such locks are used on garden sheds, greenhouses, garden gates, and cupboards, fig. 48. They are also used in period buildings, especially on the less-important doors. There are similar brass-cased versions of these interior privacy locks for a heritage appearance on high status doors. A few, sometimes pre-cut keys, are available for such privacy locks.

Figure 48 modern British privacy warded doublehand rim 2bolt, and deadlock

1 skeleton key, not even 5, certainly could not open ALL warded locks.

From early in the 20C, in Britain, door locks were increasingly mortice lever locks with sash wards, such as fig. 42 above. 2- and 4-lever locks were most common, so not a great number of differs from levers. These were supplemented with wards to reduce the success of casual trial of keys. However, the wards could be skeletoned by a burglar, leaving only the lever differs to be tried. A set of skeleton keys could be made for these, one for every possible lever step pattern, all with the wards skeletoned. For a burglar, this might have made trial of keys feasible.

Other wards could be, and have been, used in high security lever locks. Some 19C British door locks had a bridge ward, such as figs. 50-51.

Figure 49 Chubb 14lever sash ward rim lock

Figure 50 key to Chubb bridge ward lever mortice lock

Some locks had warded levers — there is no known record of such locks being defeated by manipulation.

Particularly from the 1960s onwards, lever mortice locks of higher security than hitherto in widespread use became normal, following the publication of a British Standard for door locks, BS3621. Such locks have a minimum of 5 levers, usually with other pick-resisting features. Such locks do not rely on wards for differing,

though some have sash, and other, wards to hinder manipulation, or a collar ward as a keyhole bush to reduce wear.

Many other lever locks are used in Britain, Europe, and some other parts of the world. As lever locks are used on many British and European safes of high quality and security, such locks are neither out-of-date nor insecure.

Up until the 1960s in Britain, there was a great variety of warded padlocks in use. Most of these could not be opened by the common set of 5 padlock skeleton keys from America. Many British warded padlocks had the keyhole on the front, not the bottom. Then there were locks with both wards and levers.

European 'number locks'

In northern Europe, indoor and other privacy locks are still fairly common, of a type called 'number locks'. These rely solely on wards, having bulleted keyholes. The various ward patterns are numbered, and keys can be bought by number by users. European locksmiths can buy commercial sets of skeleton/jiggler keys for such locks. Such sets are not sold to the public.

Figure 51 modern French bullet-warded rimlock and key

Figure 52 a modern french key for a 'number' lock

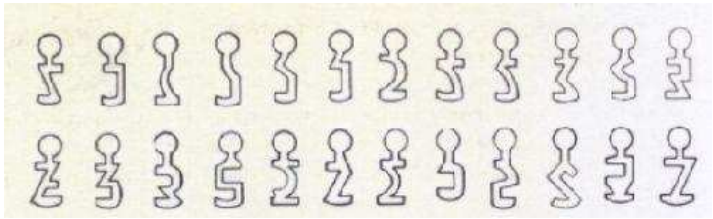


Figure 53 European 'number key' profiles

Figure 54 locksmith skeleton for European warded locks

Bulleted keyholes are also, to a lesser extent, used in British privacy locks, especially for indoor use, and occasionally in other locks.

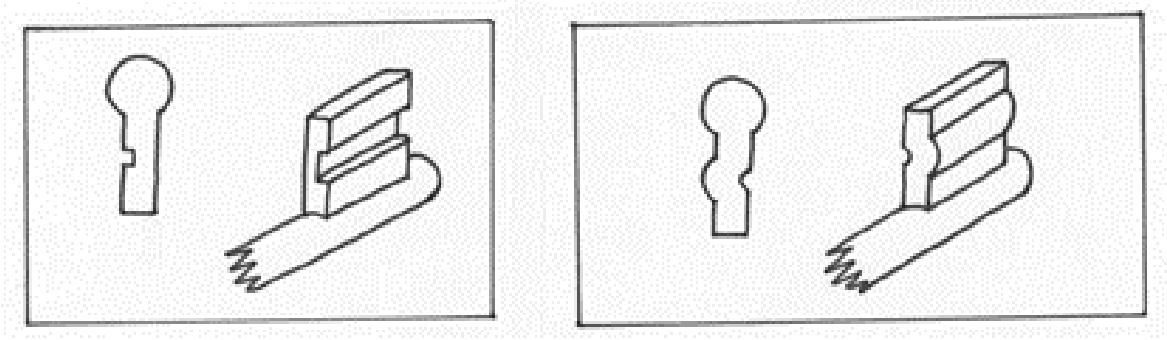


Figure 55 common British privacy lock bulletted keyholes and keys

It is common to call master keys skeleton keys but modern **master keys** are not skeleton keys. Master keys for pin tumbler, lever and other mechanisms using movable detainers function because of what is built into a specific suite of locks, and not elsewhere.

More so in the past, warding was sometimes used for mastering, or as part of mastering, in conjunction with other methods — as it still occasionally is today. See right.

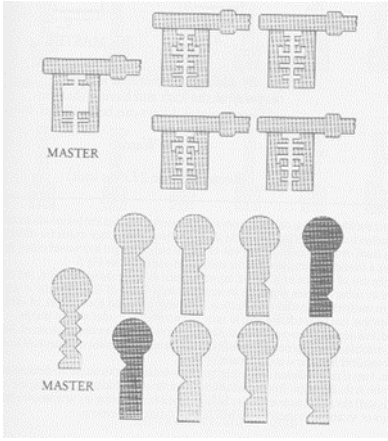


Figure 56 masterkeying with bridge wards and bullet wards

In lever locks, a set of sash wards could be designed, with a master ward cut to pass all the change sections used in the suite, whilst yet not being completely skeletoned to pass all the ward patterns that could possibly be used in such locks. In some common privacy locks, this was combined with levers. Such master-keyed suites, with a small number of differ keys, could be bought off-the-shelf, and were widely used for privacy in institutional buildings, such as schools and small office suites. Some are still in use, such as in small private hotels.

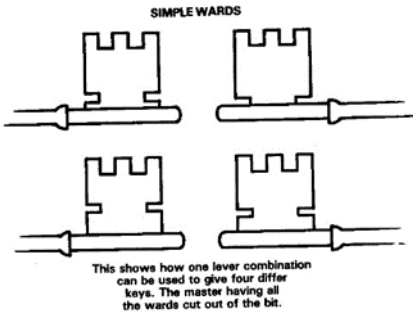

SIMPLE WARDS
This shows how one lever combination can be used to give four differ keys. The master having all the wards cut out of the bit.

Figure 57 Masterkeying with sash wards

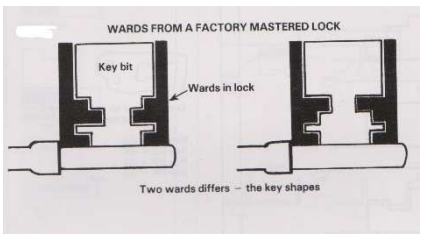


Figure 58 another example from a set of factory sash wards for a low security stock masterkey system

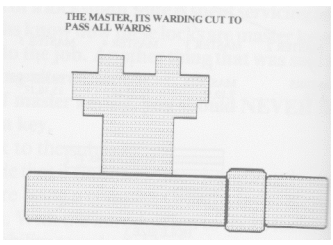


Figure 59 factory masterkey for a system such as fig.58

Some small masterkeyed suites use bullet wards for part of their differing. In modern yale-type pin tumbler locks, this use of wards is today called ‘sectional masterkeying’. These cylinder locks use bullet wards, rather than sash wards. The top MK section is a partial-skeleton section! In addition to bullet wards, sectional masterkeying uses other methods, such as master-pins.

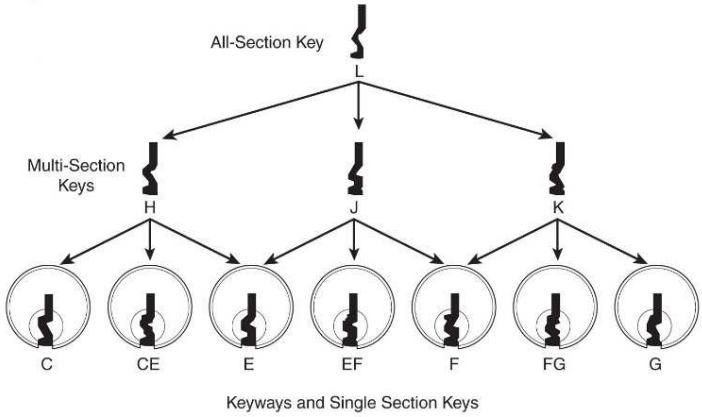


Figure 60 sectional masterkeying using bullet wards in pintumbler locks

Modern warded padlocks

Warded padlocks have been made around the world for centuries in great variety. Up until the 1960s in Britain, there was a great variety of warded padlocks in use. Many of these could not be opened by the common set of 5 padlock skeleton keys from America. Many British warded padlocks had the keyhole on the front, not the bottom. Then there were locks with both wards and levers.

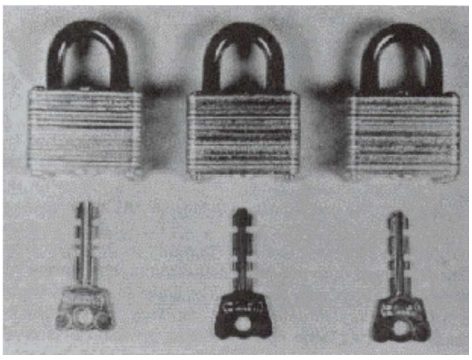


Figure 61 common warded padlocks, still used in USA and elsewhere

Warded padlocks have been losing popularity since the 1960s. They lost market share as extruded brass pin tumbler padlocks became cheap and plentiful, offering better key security. The warded padlocks continue in limited use for privacy, where their cheapness and reliability still commend them.

Warded padlocks are also still in use in America. Most modern ones have several wards within the body, and commonly have a bulleted keyhole at the bottom of the body. The key is a blade with notches, usually both sides. Two locking mechanisms are common. In both, the tip of the key blade is the essential part.

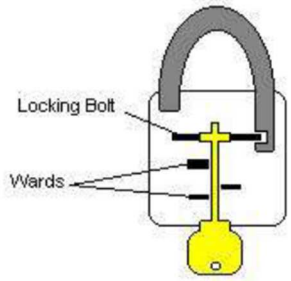


Figure 62 warded padlock with locking bolt

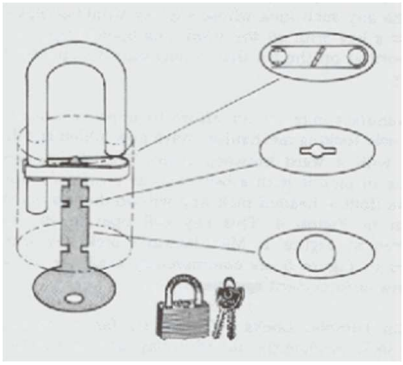


Figure 63 warded padlock with Vee spring locking

Figure 64 set of common warded padlock sketeton keys

One has 1 (or sometimes 2) sliding spring-supported bolts locking the shackle. This can be opened by an L-shaped skeleton.

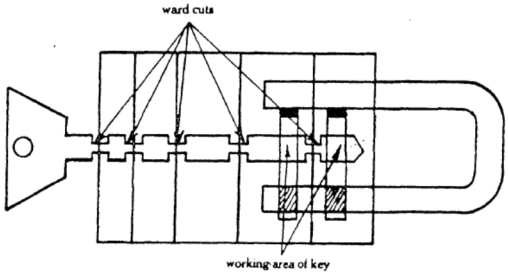


Figure 65 warded padlock wth 2 Vee springs

The other mechanism has 1 (or sometimes 2) **V**ee spring(s) whose ends lock into notches on the shackle. Typically, the arms of the **V**ee spring are spread by the blade of the key, which has to turn through several fixed wards in the body of the lock. Additionally, the keyhole is usually bulleted. These can be opened by a T-shaped skeleton (or double-T). A set of 5 skeletons which open many such locks is widely on sale.

Pass Keys

Master keys are also sometimes called pass keys, but that is also another misnomer. A **pass key** is the key to a set of locks keyed ‘to pass’ i.e., keyed alike. Such locks are used where different individual keys are not needed, such as all the outer doors and the garage of a house.

All locks achieve ‘security’ by costing an attacker time, and effort/skill to defeat.

Warded locks are often sneeringly disparaged today, particularly by persons with limited experience and knowledge of the variety of warded locks through history. As with other lock mechanisms, warded locks can provide a range of difficulty and time to defeat. There is a certain method to defeat a warded lock. A similar method can also be used to defeat pin tumbler, and lever locks. Such locks can also be picked tentatively.

The view, prevalent in some quarters, that warded, and lever locks, are ‘old-fashioned’ and ‘insecure’, is a view with ready access to an Internet-connected computer and a credit card. Today this means any tools, materials, and parts such as key blanks, from the world’s markets, are available in hours or days, delivered direct to the door. Instructional videos and texts are available instantly. This is not the world in which warded locks were made and used.

They were, generally, adequate for their time. However, in the past as now, the majority of locks in use were of modest quality and security.

Good luck making a skeleton key for these locks or the locks these keys fit:

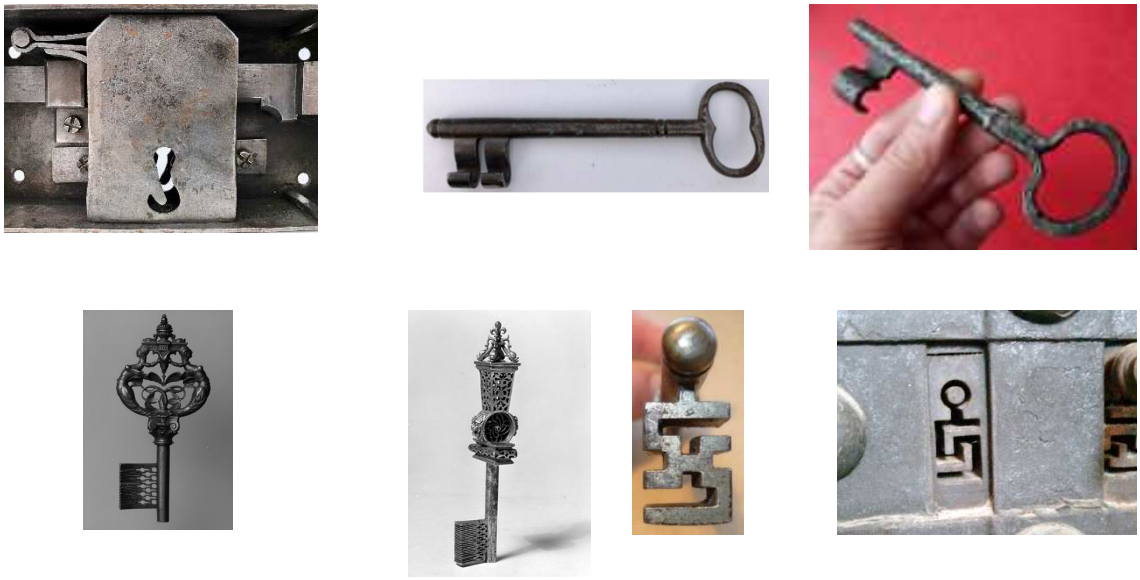


Figure 66 variety of warded locks and keys

Figure 67 modern US Master warded padlock and padlock skeleton keys

Just because a modern American warded padlock can be opened quickly with a widely-available skeleton key, it does not self-evidently follow that *all* warded locks can be opened with similar ease and speed. A typically competent modern locksmith probably could not impression a yale-type pin tumbler lock as fast as a locksport competition winner. However, he could probably do it in a matter of minutes not hours. Or he should be able to pick it in a few minutes. Making a skeleton key to many of the old locks would take longer than picking a modern lock, although sometimes other suitable tools might be successful in less time.

Defeating an old box-of-wards lock would surely take longer, much longer. As well as strong springs, some old latches had square bolts so could not be slipped by the method commonly used today for modern latch bolts. Many old warded locks had keys difficult to skeleton, and slow to fit, even with aid of modern power tools.

After seeing old warded door locks explained, a modern architect opined that ‘paradoxically, old [UK] locks are probably more secure now than when made, as burglars no longer have the tools and knowledge to defeat them’. Old stock locks with oak or other hardwood stocks, or other old rimlocks, fixed to solid hardwood doors by nails driven right through the door and clenched on the other side, would be as strongly fixed as any burglary insurer could wish.

Figure 68 box of wards and key

Figure 69 large old door with large warded rimlock and modern euromortice lock

This door has both a large old warded stock lock, and a modern pin tumbler euro fitted; which would be easier to defeat?

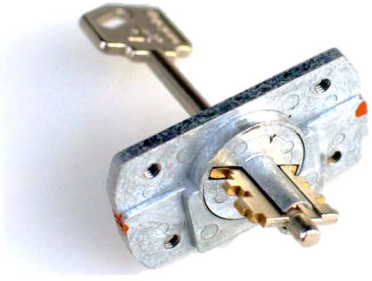
Although most common (and cheap) 19C warded locks were susceptible to skeleton keys, far from all high quality warded locks from the past were without merit. It should also be borne in mind that many were adequate in their time.

It is often forgotten that until quite late, tools and materials were unavailable to anyone outside the metal-working crafts. There were no aftermarket spare blank keys, files and vices could not be bought in a local ‘shed’. Everything — including every key — was handmade. The ironmaster who smelted iron supplied it to smiths as rods of irregular thickness and length; every metal object made, started from that. Knowledge of locks was very limited, outside of locksmiths, until recent times. So possibility of anyone outside the metal-working crafts being able to pick locks was limited. It was necessary at least to have the assistance of a metal-worker, until probably the late 17C. Undoubtedly, metal-workers could and did make lockpicks and skeleton keys, and equip criminals. Even into the 18C, access to the kit was limited, and becoming a skilled member of the underworld not easy.

Robert Greene was an English author popular in his day, who memorably described his Tudor contemporary and rival William Shakespeare as ‘an upstart crow’. He wrote an exposé of criminal methods, and includes a story about an itinerant tinker. In an age when damaged items were repaired not thrown away, the tinker (a craftsman who worked mainly with cold metal, unlike the blacksmith who worked with hot iron) was a welcome and valued craftsman.

Greene recounts a story about an itinerant tinker with a sideline in burglary. A wise Lancashire magistrate, as the tinker worked, ‘curiously’ looked through the tinker’s toolbag, asking about each tool, until he found lockpicks, which he affected to ignore. Then he thought to ask the tinker to go to Lancaster, as his friend the Governor of Lancaster Castle (which was in use as a prison) needed a tinker’s services. The magistrate wrote a letter (which the tinker could not read) for the tinker to take to the jailer, there being no organised mail service then. It was a legal order committing the tinker to prison to await trial — the evidence of his guilt was in the bottom of his toolbag; and the tinker was hanged at the next assize.

The pin tumbler lock was adequately secure for several decades, and is today probably the most widely used lock, on doors, padlocks, and elsewhere. Yet methods of defeating it now widely used were invented well before it became the most widely used key mechanism. And despite being pickable, actually burglars rather rarely do pick locks, and the pintumbler lock continues to be used.

Warded locks should not be dismissed as worthless. They can still provide inexpensive privacy, and with their mechanical simplicity, rugged reliability. And wards are a valuable addition to the security of some other types of lock.

If you still think a Kwikset deadbolt is a secure lock, and all ‘skeleton key’ / bit key locks are insecure, have a look at these European door locks. The red one with its included 7” box staple, is a ‘British Standard’ lock from Britain. The [laminated, in this example] bolt is saw-resistant; the raised plate on the lockcase is drill-resisting protection. The 12lever doublebit double-throw multipoint lock with barrel-and-curtain is from Italy etc. Each of its saw-resistant bolts is about the size of the US deadbolt. Many have 70 or 80mm throw.